

Rhodora

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THE AMERICAN VARIETY OF SAXIFRAGA AIZOON

FRED K. BUTTERS

(Plate 817)

Saxifraga Aizoon Jacq. is the only American representative of the essentially European section *Euaizoonia* (the genus *Chondrosea* of Haworth). According to the treatment of Engler and Irmscher¹, this section contains 10 species all of which occur in the mountains of central and southern Europe. Eight of the species are confined to more or less restricted areas of this region; *S. Cotyledon* L. occurs also in western and northern Scandinavia and in Iceland, while *S. Aizoon* has a truly remarkable range: all the central European mountains from the Pyrenees to the Carpathians; southward to Corsica, in the Apennines to the latitude of Naples, and to the mountains of northern and central Greece; eastward to Asia Minor, Armenia and (as the subspecies *cartilaginea*) to the Caucasus; two restricted districts in Scandinavia²; Iceland³; East Greenland to latitude 71° 20' N., West

¹ Das Pflanzenreich, IV, 117 (1919).

² *S. Aizoon* is very rare in Scandinavia, occurring only in two widely separated districts: 1. the Ryfylke east of Stavanger in southeastern Norway in latitude 59° 25'; 2. in the mountains east of Saltdal in latitude 67°, where it occurs on both sides of the boundary between Norway and Sweden. There is a considerable Scandinavian literature in reference to this plant, from the standpoint both of its taxonomy and its plant-geography. See Neuman, L. M. Bidrag till Kännedomen af floran vid Saltenfjord och på Sulitälmaområdet i Norge. Botaniska Notiser 1905, p. 263, where he described the northern plant as a new subspecies, *S. Aizoon* Jacq. **Laestadii* L. M. Neuman (a name completely ignored by Engler and Irmscher); Dahl, Ove, Botaniske undersøgelser i indre Ryfylke, Forhandlinger i Videnskabs-selskabet i Christiania 1906, no. 3 (p. 35) and 1907, no. 4. (p. 34), where the occurrence of the more southerly plant is discussed, and a new form is described; Nordhagen, Rolf, Om *Arenaria humifusa* Wg. og dens betydning for utforskningen av Skandinaviens eldste floraelement, Bergens Museums Årbok 1935 Naturvidenskapelig rekke Nr. 1 (pp. 125, 135,

Greenland to latitude $74^{\circ} 31'$; Baffin Island to latitude 73° ; Newfoundland; and on the continent of North America from northernmost Labrador to northern Vermont and westward to Hudson Bay, the Lake Superior region, and apparently to the Saskatchewan Valley and Great Slave Lake. It does not occur anywhere in the Rocky Mountains or westward.⁴

As early as 1830 this extraordinary range caught the attention of students of phytogeography. Ernst H. F. Meyer makes the following observation: "On account of the singular geographical distribution I had suspected that the American and Icelandic plant differs from the Austrian and Swiss species until a sedulous examination of Greenland specimens taught me the contrary."⁵

163); Skandinavias fjellflora og den relasjoner till den siste istid, Nordiska (19, skandinaviska) naturforskarmötet i Helsingfors 1936, pp. 93-124.

⁴ Engler and Irmscher say, "Auf Island und den Faeröen fehlend." This is certainly erroneous in so far as it concerns Iceland. There is an Icelandic specimen in the Gray Herbarium, and Ostenfeld and Grøntved say in their Flora of Iceland and the Faeroes, "Icel. rare, found in a few places of the N.E. and SW"

⁵ I have seen no specimens from west of Lake Superior. It is reported from Shoal Lake, Manitoba (just north of Lake-of-the-Woods) in the Check List of Manitoba Flora, published by the botanical section of the Natural History Society of Manitoba, in 1922. The reports of its occurrence in "Saskatchewan" go back to Hooker's Flora Boreali-Americana and are undoubtedly authentic, though the exact extent of the country covered by this term in 1834 is somewhat doubtful. Its occurrence in the North-west Territories about Great Slave Lake is reported by Nicholas Palunin in his Botany of the Eastern Arctic, Palunin having presumably taken his record from Raup's Phytogeographic Studies in the Athabaska-Great Slave Lake Region.

There is one report of this species from the Canadian Rocky Mountains, quite definitely erroneous. In his *Phytogeographic Studies in the Peace and upper Liard River Regions, Canada* (Contrib. Arnold Arb. 6, 170), H. M. Raup cites without comment an old report by John Macoun of its presence at the foot of Mt. Selwyn, at the west end of Peace River Pass, Macoun's plants, collected on this occasion, were lost. An examination of the original record (*Canadian Geological Survey; Report of Progress 1875-76*) indicates that the origin of this report was probably a *lapsus calami* on Macoun's part. On p. 146 of the report, in his account of the climb of Mt. Selwyn, he speaks of stopping at the banks of a stream at the foot of the mountain and collecting "*Saxifraga oppositifolia*, *rivularis* and *Aizoon*" and a half dozen other plants. This is the only mention of *S. Aizoon*. It does not appear on p. 148 in the systematic list of the plants collected on Mt. Selwyn (all the other plants mentioned on p. 146 are in this list), nor is it included in the long appendix (pp. 186-232) which includes all the plants collected by him "in the summers of 1872 and 1875 in the Saskatchewan country and on the Peace River, also on the Rocky Mountains in British Columbia and Vancouver Island." Furthermore he does not include this locality for *S. Aizoon* in his *Catalogue of Canadian Plants* published seven years later. It appears almost certain that in the single place where "*Aizoon*" occurs it was written by mistake for "*aizoides*", a species which appears in all the above mentioned lists, and which might well occur in the sort of place he is describing.

⁶ Meyer, Ernesti, *De Plantis Labradoricis Libri Tres*. Leipsig. 1830. Quam ob singularem distributionem geographicam plantam Americanam atque Islandicam ab Austriaca atque Helvetica specie differre suspicatus eram, donec specimina Groenlandica sedulo examinata contrariam me docuerunt.

Four years later W. J. Hooker⁶ states: "The [American] specimens differ in no respect from those of Europe". Following such categorical statements it has been customary to regard the American plant as completely identical with the European species or even to identify it with certain European subspecific groups.

The European plant is extremely variable in many respects, so much so that Engler and Irmscher designate the species as a "typus polymorphus" and recognize two subspecies, 18 varieties, 8 subvarieties, and 11 forms, a considerable number of which have at one time or another been described as species. They say "hujus typi polymorphi varietates et formae difficile extricantur", and further that they have found the leaf-form and serrature to be the most reliable characters. They identify the American forms with certain central European ones, saying for the plant of Baffin Island "ausschliesslich var. *montana* sub var. *subaffinis*" and for the plants of Greenland and subarctic America, "ausschliesslich var. *montana* subvar. *recta* und subvar. *subaffinis*."⁷

Despite this unanimity of botanical opinion concerning the status of the American plant there are certain small but real differences between it and all the European forms that I have seen. The seeds of the species are about $\frac{3}{4}$ mm. long, somewhat ridged, and minutely verrucose. The papillae are well seen only under a compound microscope. Those of all European plants examined are crowded, covering all parts of the seed quite uniformly, and when seen in profile appear as steep-sided domes 8–10 μ high (PLATE 000, FIGS. 4 and 5). The papillae in the American plant are only about half as high, with more gradual slopes, less crowded and on parts of the seed, particularly between the ridges, they may be almost or quite obsolescent (FIGS. 9, 10 and 11). Probably on account of these differences in the papillae, perfectly ripe American seeds often appear somewhat glossy, while the European ones are always dull.

Another difference which appears to be diagnostic is in the

⁶ Flora Bor.-Am. 1, p. 243 (1834).

⁷ Engler & Irmscher, loc. cit. pp. 501 and 502. Their names for these European forms are not in accordance with the International Rules, since the oldest varietal name seems to be *S. Aizoon* β *recta* Ser. ex D. C. Prodromus iv. p. 19 (1830). At least it antedates their newly coined var. *montana* by 89 years.

configuration of the stomium of the dehiscent capsule. In the European plant the edges of the beaks along the line of dehiscence are relatively thick, while outside the opening thus defined are somewhat vague folds. In the American plant, on the other hand, the separating edges of the carpel-beaks are relatively thin, while a thick and definite cord runs down each side of each beak and unites with the corresponding cord of the other beak to form a distinct outer frame about the stomium (FIGS. 2, 3, 7, and 8).

Besides these characters, which appear to be entirely consistent, there are a number of tendencies which, while usually giving a characteristic appearance to the American plant, are not sufficiently distinct to separate it sharply from the European. The leaves of well developed plants have much the same shape as in the European var. *recta* but with a little greater tendency to be somewhat cuneiform. However in poorly developed rosettes of normal plants and in the depauperate plants of colder habitats the leaves tend to be obovate-cuneate to nearly elliptic, quite different from the short linguiform leaves of the corresponding European subvar. *subaffinis* and approaching those figured by Engler and Irmscher⁸ for var. *typica* subvar. *brevifolia*.

In general the leaves of the American variety seem to be thicker than those of the European ones. In herbarium material of the European plant it is often possible to observe the entire vein-system of a leaf by holding it up in front of a strong light. In no case does this hold for the American plant.

The inflorescence in well developed European plants usually has widely spreading branches which curve upward from an almost divaricate base. In the American plant the branches of the inflorescence are more ascending, and the whole panicle denser in consequence.

In the American plant the cauline leaves tend to be larger and more numerous than in the European. There are a good many exceptions to this, but in looking through large collections of the two, one is struck by the greater leafiness of the American specimens.

There is a strong tendency for the fruiting ovary of the American plant to be better developed above the insertion of the sepals,

⁸ Ibid. p. 490.

and for that of the European plant to be better developed below this level. This character differs considerably among the various individuals in a single collection, and again there is considerable overlapping. All attempts to reduce it to a mathematical formula have broken down, chiefly through difficulties in getting comparable measures of the beaks of the carpels. These differ so much from plant to plant in degree of curvature, amount of splitting on dehiscence, and length of styles and stigmas that it has proved impossible to find any datum-plane that does not introduce too large errors of measurement. The base of the fruit also is often rather indefinite, particularly in the American plant. Despite these difficulties, it is evident on examining a large number of American plants, that the top of the fruiting ovary usually overtops the sepals rather conspicuously, while in the European plant it is generally pretty much concealed by them.

In view of these tendencies, and the two diagnostic characters of fruit and seed it seems that the American plant should be considered as a variety distinct from all the European varieties, which I am calling var. *neogaea*⁹. All the American specimens examined belong to this variety, also all those from Greenland, and the single specimen seen from Iceland. Unfortunately no Scandinavian specimens have been seen, and it is impossible to say whether the plants of Scandinavia are most closely related to the New World variety or to the plants of southern and central Europe¹⁰.

⁹ *SAXIFRAGA AIZOON* Jacq. var. *neogaea*, var. nov. Var. *rectae* Ser. ex D. C. (var. *montanae* Eng. & Irmsch.) similis sed seminibus laevioribus papillis minus altis et minus crebris, fructuum partibus superioribus exsertis, stomis margine tenui restibusque lateralibus prominentibus instructis. TYPE (in herb. Minn.), Butters, Burns and Hendrikson no 52, cliff south of Mountain Lake, Cook Co., Minnesota.

¹⁰ The plants from the two Scandinavian localities are not alike, and Nordhagen has shown that the differences are genetic, by growing them in pots side by side (see photograph in his 1936 paper, p. 107). The northern form (subsp. *Laestadii* Neum.) is described as very dwarf, with elliptic or obovate basal leaves and almost capitate cymes (the axis of the inflorescence 0–5 mm. long, the pedicels equalling the flowers or shorter). The petals are described as yellowish, with rose-colored dots, erect or semi-erect in anthesis. Nothing like this appears to occur in America. The southern form is larger but quite variable in stature, the flowers flat and varying from greenish yellow to milk-white with red dots and stripes. It is said to be intermediate between subsp. *Laestadii* and the central European forms. Nothing is said concerning the fruits and seeds of either form.

Nordhagen is convinced that the northern station represents a survival through the last glacial period a little to the west of its present locality. Concerning the southern station he is uncertain whether the plant is a relic or whether it represents an invasion from Denmark or the "North Sea Continent" at the close of the last glaciation.

As is the case with several of the European varieties, var. *neogaea* occurs in two confluent forms. In the southern part of its range, and occasionally even in the far north the usual form has the leaves of the mature rosettes linguiform and 1.5–4.5 cm. long, the flowering shoots (7–) 10–30 (–45) cm. tall and the many-flowered inflorescence paniculately branched. This I regard as typical var. *neogaea*.

On the other hand, in the colder parts of its range there is a form with obovate-elliptic basal leaves 7–12 mm. long, flowering branches only 2–12 cm. high, and the inflorescence few-flowered and short, sometimes nearly capitate. There are no differences in flowers, fruits or seeds.

The extremes of these two forms are very different in appearance, but they pass into one another by insensible gradations, and leaf-form and inflorescence-height do not entirely corellate. Moreover the same small, rounded leaves are sometimes seen in young rosettes of the tall form, and occasional depauperate individuals closely simulating the dwarf northern plant occur along with the normal form even at the southern limit of its range. The two forms are probably purely ecological, and their geographical distribution merely an expression of the climatic differences in the habitats, but it is possible that, as in the case of the two Norwegian forms, culture under similar conditions would disclose some real genetic differences. Engler and Irmischer treat similar pairs of European forms as subvarieties. However until the dwarf form can be proved to be more than an ecological response to a cold climate and unfavorable growing conditions it seems better to treat it as a form¹¹.

All specimens seen from Vermont, the Lake Superior region, and Canada south of the St. Lawrence River belong to typical var. *neogaea*, though occasional depauperate individuals occur in several of the collections. From farther north, the following may be considered typical var. *neogaea* or at least as containing some quite typical individuals¹². NORTHERN QUEBEC: Ile St.

¹¹ *SAXIFRAGA AIZOON* Jacq. var. *NEOGAEA* forma *frigida*, forma nov., foliis rosularum ellipticis vel obovato-spathulatis 7–12 mm. longis, caulibus 2–12 cm. altis, inflorescentia brevi corymbosa pauciflora. TYPE (in herb. Minn.) E. C. and Lucy B. Abbe and J. Marr. 3860. Hill at Boat Opening, Manitounuk Sound, Quebec.

¹² In these northern collections there are more depauperate individuals than in collections from farther south, and in ample collections there is usually a complete gradient from the largest, typical specimens down to dwarf individuals which must be considered as forma *frigida*. As an example may be cited the collection from Beach

Genevieve, Mingan Islands *Ff. Marie-Victorin et Rolland-Germain* 18793 (G)¹³; calcareous tableland east of Blanc Sablon, *Fernald and Wiegand* 3524 (G); Beach Creek, Richmond Gulf, *Abbe and Abbe* 3249; Old Factory River, *W. G. C. Todd* Aug. 3, 1912 (P). NORTHWEST TERRITORY: Tukarak Island, Belcher Islands, Hudson Bay, *Abbe, Abbe, and Marr*, 4008. NEWFOUNDLAND: Tilt Cove, Northern Shores of Notre Dame Bay, *Fernald and Wiegand* 5520 (G). LABRADOR: September Harbor, *Harlow Bishop* 354 (G). GREENLAND: Neria (61° 30' N.) *I. Eugenius*, Sept. 2, 1925, July 31, 1926 (G); Disko, Godhavn (69° 14' N.) *A. E. Porsild*, Sept. 10–20, 1922 (G); Amitsuaitsiaq Fjord (70° 45' N.) *M. P. & R. T. Porsild* July 10, 1929 (G) (the tallest plant 23 cm. high); Uniarfik Fjord (71° 56' N.) *M. P. Porsild*, Sept. 7, 1934 (G).

The following collections may be cited as *S. Aizoon* var. *neogaea* f. *frigida*. NORTHERN QUEBEC: Baie des Moutons, *H. St. John* 90509 (G); Blanc Sablon, *M. T. Doult* June 25, 1939 (P); Great Whale River, *E. C. & Lucy B. Abbe* 3934; Boat Opening, *Abbe, Abbe and Marr* 3860; Port Harrison, *Mrs. G. K. Tallman*, Aug. 7, 1936. NORTHWEST TERRITORY: South Twin Island, James Bay, *M. T. Doult* 2292 & 2347 (P); Goose Id., Belcher Ids., *J. K. Doult* 218 (P); Tukarak Id., Belcher Ids., *J. K. Doult* 209 & 309 (P). LABRADOR: Cape Mugford, *W. E. C. Todd*, Aug. 2, 1920 (P); 20 mi. north of Nakvak, *H. S. Forbes*, Aug. 28, 1908 (G); Rama, *J. D. Sornborger* 37. NEWFOUNDLAND: Fishing Head, St. Anthony, *E. C. Abbe* 425; Chimney Cove, *A. C. Waghorne*. BAFFIN ISLAND: Lake Harbour, *M. O. Malte* 121037 (G); *N. Palunin* 429 (G); Griffen Bay, *David Potter* 8104 (G). GREENLAND: Disko (69° 15' N.) *Aa. Jensen*, 25 July 1936 (G); Safiorfik (72° 23' N.), *Ussing*, 22 July, 1886 (G). ICELAND: Hrethavatn, *Edith Scamman* 1407 (G).

That *Saxifraga Aizoon* originated in the mountains of southern or central Europe seems certain in view of the large number of related species in that region, and also the great variability of *S. Aizoon* itself there. The North American population must have reached this continent by a trans-Atlantic route, presumably by way of Scandinavia, Iceland and Greenland. At least,

Creek, Richmond Gulf, *E. C. and Lucy B. Abbe* no. 3249. This collection contains 44 flowering specimens. The flowering shoots range from 6.5–21 cm. in height, forming an unbroken series between these extremes. The leaves also vary continuously from elongated linguiform in the large specimens to short-elliptic in the smallest ones. The largest specimens are typical var. *neogaea*, the smallest forma *frigida*.

¹³ Through the kindness of the Curators of the Gray Herbarium and of the Herbarium of the Carnegie Museum, Pittsburgh, I have been able to examine a large number of sheets from these institutions. In the following list they are indicated with (G) and (P) respectively; those in the Herbarium of the University of Minnesota are not marked.

if it traversed the British Isles and the Faroes all traces of its presence there were obliterated by the last glacial advance. Its wide distribution in northeastern North America implies a fairly early arrival in the western hemisphere, certainly not later than some of the mid-Pleistocene interglacial periods. On the other hand, a Tertiary invasion seems unlikely in view of its failure to reach the Cordilleran region, or the Canadian West-Arctic. The stock that reached North America must have been genetically pretty uniform since one of the remarkable characteristics of the American population is its uniformity except in such characters as are directly correlated with more or less favorable habitats. This uniformity of the American population argues in favor of an interglacial, rather than a Tertiary invasion of North America, as, in a species which is so extremely variable in Europe, some mutation and division into geographical races would be expected in North America if the plant had been resident here during the whole of the Pleistocene.

The species probably survived the Wisconsin glaciation in numerous refuges. It is almost ideally adapted for survival on a nunatak-area of even rather limited size. One of its most remarkable characters, moreover, is the vigor and speed with which it has occupied suitable sites in the center of the glaciated tract, far from any possible center of survival. Its occurrence on the islands in Hudson Bay is a striking example, for these islands were not only heavily glaciated, but for an indeterminate time after the Wisconsin glaciation they were submerged by the waters of the Bay. In this respect the behavior of the species in North America is in sharp contrast to its behavior in Scandinavia.

In northeastern Minnesota it occurs quite abundantly in Cook Co., on north-facing slate cliffs in a region where the Wisconsin glaciation was apparently confined to valley glaciers pushing into the upland from the main ice-lobe in the Lake Superior basin. One can see no reason why it may not have continued *in situ* since the last interglacial period.

EXPLANATION OF PLATE 817

FIGS. 1-5, *SAXIFRAGA AIZOON*, var. *RECTA* from "Transsilvania occidentalis. Biharia. in montibus ad Vidram", *Simkovichs Fl. Exsicc. Austro-Hungarica*, No. 1290 (distributed as *S. robusta* Schott, Nyman et Kotschy, cited by Engler and Irmscher as *S. Aizoon* var. *montana*): FIG. 1, inflorescence, $\times \frac{1}{2}$;

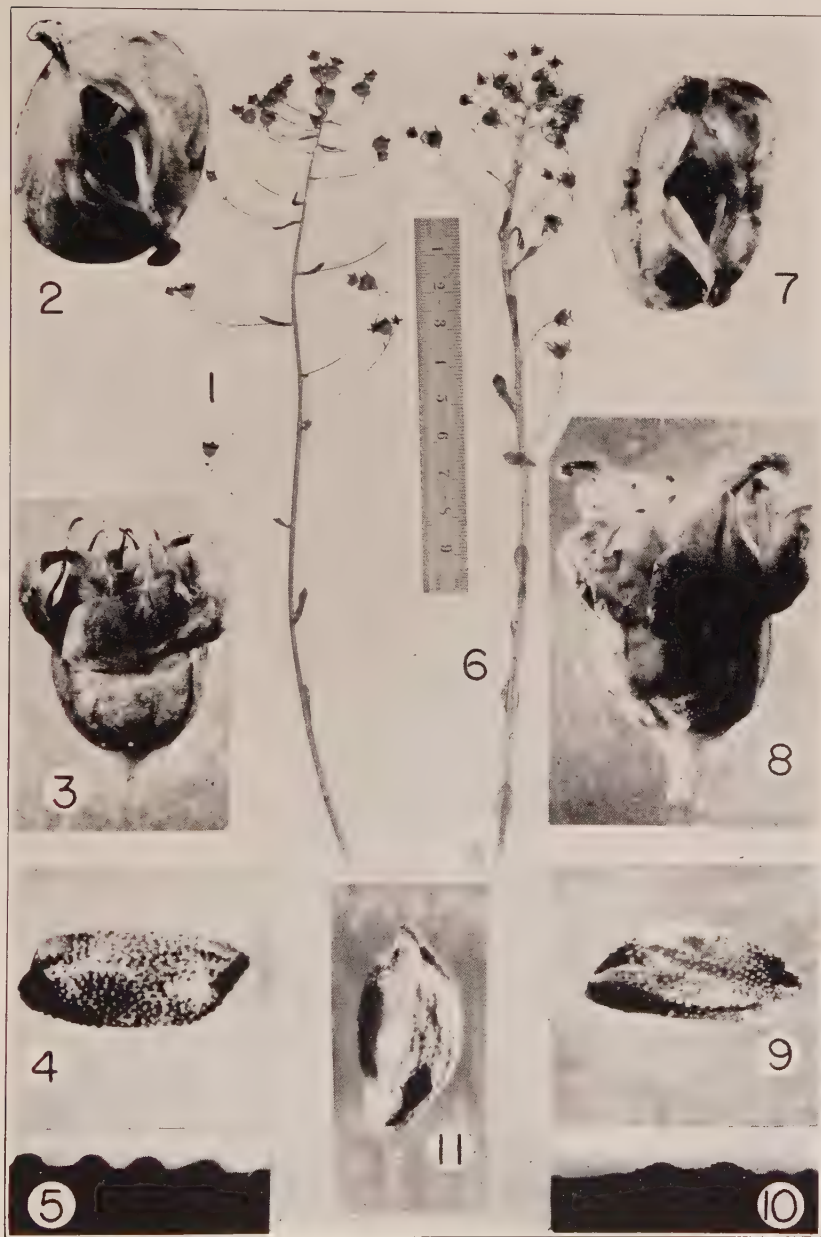


Photo. E. C. Abbe.

SAXIFRAGA AIZOON var. RECTA, from Transsilvania: FIG. 1, inflorescence $\times \frac{1}{2}$; FIG. 2, ripe capsule from above $\times 8$; FIG. 3, ripe capsule from side $\times 6$; FIG. 4, seed $\times 30$; FIG. 5, sculpturing of seeds $\times 225$.

Var. NEOGAEA, from TYPE: FIG. 6, inflorescence $\times \frac{1}{2}$; FIG. 7, ripe capsule from above $\times 8$; FIG. 8, ripe capsule from side $\times 6$; FIG. 9, seed $\times 30$; FIG. 10, sculpturing of seed $\times 225$.

Var. NEOGAEA f. FRIGIDA: FIG. 11, seed $\times 30$, from Great Whale River, Quebec.

FIG. 2, ripe capsule from above, $\times 8$; FIG. 3, ripe capsule from side, $\times 6$; FIG. 4, seed, $\times 30$; FIG. 5, detail of sculpturing of seed, $\times 225$.

FIGS. 6–10, *S. AIZOON*, var. *NEOGAEA*, type, University of Minnesota, from Mountain Lake, Cook Co., Minnesota. *Butters, Burns and Hendrickson*, no. 52: FIG. 6, inflorescence, $\times \frac{1}{2}$; FIG. 7, ripe capsule from above, $\times 8$; FIG. 8, ripe capsule from side, $\times 6$; FIG. 9, seed, $\times 30$; FIG. 10, detail of sculpturing of seed, $\times 225$.

FIG. 11, *S. AIZOON*, var. *NEOGAEA*, f. *FRIGIDA* from Great Whale River, Quebec, *Abbe and Abbe*, no. 3934; seed, $\times 30$.

NOTES ON THE FLORA OF ROANOKE COUNTY, VIRGINIA¹

CARROLL E. WOOD, JR.

A FEELING akin to both chagrin and indignation used to come over me upon seeing range-maps of various plants in botanical journals and seeing Roanoke County, the area with which I am most familiar, seemingly ignored. In almost every instance, this western Virginia county is represented, not by a black dot, but by a large white void, as though it were an unexplored area. It soon became apparent that it was, indeed, a botanical blank: that few collectors had ever visited the area, and as a result it is practically unrepresented in the larger herbaria. This is somewhat surprising, for the region is easily accessible, a wide variety of habitats is present within an altitude-range of 3000 feet and the location of the area is such that floral elements of several types are intermingled, producing an area of unusual phyto-geographical interest. A spring, a fall, and a summer of intensive collecting have proved the county indeed worthy of attention and have filled the blank for almost a thousand plants, many of which were to be expected, but some of which were distinct surprises or even novelties. At the present time at least 1025 species and varieties of vascular plants (including approximately 150 introduced species) are known to me from Roanoke County, and it is quite certain that there are many more as yet uncollected. Some of the more interesting plants are worthy of record and these will be noted presently.

Roanoke County is located at the lower end of the Shenandoah Valley in west-central Virginia, the main valley highway, Route

¹ The records included here are taken from a thesis accepted by the faculty of the Graduate School of Arts and Sciences of the University of Pennsylvania, January, 1943, as partial fulfillment of the requirements for the degree of Master of Science.

11, approximately bisecting it. It is roughly pentagonal in shape and includes 305 square miles, being thus somewhat smaller than the surrounding counties. The chief city, Roanoke, an industrial and railroad center with a population of about 70,000, lies on the Roanoke River in the large central lowland, Roanoke Valley, which extends completely across the county, a distance of twenty miles. Salem, the county seat, eight miles west of Roanoke, and Vinton, adjoining Roanoke to the east, are the only other communities of any considerable size, the rest being small and scattered villages. The residual soils of the valley, resulting from the erosion of limestone and dolomite, are fertile and widespread and have played a large part in the human history of the area. The rolling valley-floor, about 1000 feet above sea-level, is accordingly intensively cultivated and little forest remains there.

In spite of the central lowland, the region is essentially mountainous, including parts of the *Blue Ridge* and *Appalachian Valley and Ridge Physiographic Provinces*. The mountains rise to 3000-4000 feet above sea-level and were formerly covered with magnificent deciduous forest. None of the original forest remains, however, having been replaced by second-growth woods as a result of extensive lumbering operations and fires. The latter have not been frequent in recent years but formerly played a large part in the reduction of the forested areas.

The southern third of the county, south and east of Roanoke Valley, is an upland formed by the Blue Ridge and its foothills. Most important are Bent and Poor Mountains, parts of which form a plateau with an elevation of about 3000 feet. The great mass of Poor Mountain rises some 2500 feet above the valley-floor to an altitude of 3960 feet, the highest point in the county. This is the most rugged part of the area and is sparsely settled and poorly developed. Rainfall is slightly greater than in other parts and conditions are more suitable for plants of northern affinity, which, indeed, seem to occur here more frequently than elsewhere in the county.

The northwestern third, on the other hand, consists of parallel northeast-southwest mountains with the narrow intermontane valleys so characteristic of the Valley and Ridge Physiographic Province. The long, narrow, even-crested ridges of resistant

sandstone, notably Fort Lewis and Catawba Mountains, rise above the valleys to elevations of about 3000 feet with scattered points somewhat higher. The valleys are cultivated, but the ridges are generally untouched.

The Blue Ridge portion of Roanoke County is occupied chiefly by Pre-Cambrian crystalline rocks (gneisses and schists) which weather readily, producing a heavy, red soil. The central and northwestern parts, however, are mainly sandstones, limestones and shales of Palaeozoic age, including more than twenty formations ranging from Lower Cambrian to Lower Mississippian. A great fault along the western edge of the Blue Ridge marks the dividing line between the two areas.

With the exception of the extreme northern portion tributary to the James, drainage is almost entirely into the Roanoke River which rises in Montgomery County to the west, traverses Roanoke Valley and, breaking through the Blue Ridge at the eastern boundary of the county, flows southeastward across Virginia, finally emptying into Albemarle Sound in North Carolina. The river has cut down varying depths below the valley-floor—about 700 feet at the west and 50 at the east—and the erosion of the comparatively soluble limestones has resulted in the formation of steep bluffs and cliffs in places, providing distinctive habitats for calciphilous plants.

The diversity of relief coupled with the wide range of geologic formations provides many different types of habitat, ranging from limestone cliffs and rich, wooded bluffs to sterile, acid slopes supporting an ericaceous flora to shaly areas yielding such plants as *Clematis albicoma* var. *coactilis*, *Senecio antennariifolius*, and *Brauneria laevigata*. Ponds and lakes are absent from the region, but the shores of Roanoke River and its tributary streams provide limited aquatic habitats, and two marshes in Roanoke Valley fed by limestone springs (with which the region is abundantly supplied) have yielded a number of interesting plants among which *Hibiscus palustris* is most conspicuous. Bogs are unfortunately lacking; *Sphagnum* is practically unheard of in the county, having been found thus far only in a small pond-hole at the base of Fort Lewis Mountain north of Salem. Of some interest is a fenster of Clinch sandstone, Round Hill, which rises a hundred feet above a limestone region just north of the

city of Roanoke. Although absent from the surrounding neutral area, plants of acid soils occur on this "island," as might be expected.

As previously noted, Roanoke County has, with few exceptions, been untouched botanically. Apparently not many more than eighty species have been recorded from this area in the literature and these records are mostly the result of collections made by members of the Torrey Botanical Club at Roanoke in 1890, 1891, and 1892.

In the late spring of 1890, Dr. and Mrs. N. L. Britton, accompanied by Addison Brown, Thomas Hogg, Anna Murray Vail, and Millie Timmerman (now Mrs. H. Ries), stopped for an afternoon at Roanoke and after riding to the end of the trolley-line, walked towards the Roanoke River, stopping to collect on the limestone bluffs. As a result of these collections *Clematis Addisonii* and *Penstemon canescens* were named by Britton and some fifty species were reported by Miss Vail in her account of the trip.¹ The next year J. K. Small and A. A. Heller spent a day on the river-bluffs and noted twenty-six species² half of which had not been found by the preceding party. Small, Miss Vail and others again visited the locality in 1892 and, although they found the hill mostly quarried away in the construction of streets, reported thirteen species³, nine not previously noted. This locality is now completely covered by the city and some of the seventy species have not since been found elsewhere in the county. A few additional scattered records of casual collections have been published, but the accounts of these three trips comprise the bulk of botanical data concerning Roanoke County, Virginia.

In recent years a few botanists have passed through the area and specimens may be found in various herbaria. Dr. P. M. Patterson has accumulated a small herbarium at Hollins College near Roanoke and a number of sheets from the eastern part of the county are to be found there, while at Roanoke College in Salem there is a small collection of vernal species. Dr. Patterson and Professor G. G. Peery have kindly permitted me to check

¹ Mem. Torrey Bot. Club 2: 27-53. 1890.

² Ibid., 3: 1-39. 1892.

³ Ibid., 4: 92-202. 1893-94.

through their respective herbaria and some of these records are included here.

The bulk of the species is represented by my collections in 1940, 1941 and 1942, fifty years after the Torrey Club visits, comprising approximately 3000 numbers from all parts of the county. The majority of these specimens are in the Herbarium of the University of Pennsylvania, but a number have been distributed to other institutions, notably the Gray Herbarium and the Academy of Natural Sciences of Philadelphia. In the notes which follow, these herbaria are designated by appropriate letters: A, Academy of Natural Sciences of Philadelphia; G, Gray Herbarium; P, University of Pennsylvania. Collection-numbers unless otherwise noted are my own.

I am greatly indebted to the many people who have made this paper possible and would like to express here my appreciation for their favors. I am particularly grateful to Dr. JOHN M. FOGG, Jr., to Dr. EDGAR T. WHERRY, and to Mr. BAYARD LONG who have been most cooperative and helpful with the more difficult groups and with the problem as a whole. Professor M. L. FERNALD has seen some three hundred of my specimens, has kindly advised me as to the identities or relationships of some of these, and has called to my attention several nomenclatural matters.

The species here enumerated represent for the most part range-extensions, new occurrences of rare plants, recently developed colonies of unusual weeds, etc.

DRYOPTERIS THELYPTERIS (L.) Gray, var. *PUBESCENS* (Lawson) A. R. Prince. Abundant in an open, spring-fed marsh at the headwaters of Deer Branch, no. 5456 (G, P). Apparently infrequent in this area because of the lack of suitable habitats.

ASPLENIUM PINNATIFIDUM Nutt. Fairly common in crevices of granitic cliffs above road along Back Creek, about $2\frac{1}{4}$ miles south-southeast of Starkey P. O., no. 4053 (P). The only locality known in the region.

PELLAEA GLABELLA Mett. Numerous plants in crevices in vertical dolomite cliffs along Roanoke River, $1\frac{1}{4}$ miles south-southwest of Wabun, no. 149 (P, Roanoke College); abundant on exposed dolomite along Roanoke River at Dixie Caverns, no. 3649 (G). Rather rare this far south, but the more widespread *P. atropurpurea* is abundant on circumneutral rocks in this area.

CHEILANTHES TOMENTOSA Link. Shaly slope at the base of

Twelve O'clock Knob, 1.4 miles east by north of Wabun, no. 128 (P), station now destroyed by road-building; sandstone outcrops, Catawba Mountain, five miles north-northwest of Dixie Caverns, no. 2759 (P); exposed dolomite bluffs along Roanoke River at Dixie Caverns, no. 3671 (G, P).

POLYPODIUM POLYPODIODES (L.) Watt., var. *MICHAUXIANUM* Weath. (Contrib. Gray Herb. **124**: 31. 1939). Abundant on exposed calcareous outcrops on bluffs along Roanoke River, $1\frac{1}{4}$ miles south-southwest of Wabun, nos. 1040, 4096 (P), 5111 (G). Not observed on trees, its usual habitat farther south.

EQUISETUM PREALTUM Raf. Alluvial flats along Roanoke River, $1\frac{1}{4}$ miles south-southwest of Wabun, no. 5121 (P).

These plants with the sheaths unusually firm and flaring for *E. prealtum* are strongly suggestive of *E. laevigatum* A. Br. and might well be referred to that species, although intermediate between the two in many respects. Similar intermediates are reported from Botetourt and Norfolk Counties. Typical *E. prealtum* with tight, cylindric sheaths, soon fraying, is widespread in Roanoke County along streams and on rich, moist slopes. On the other hand, unmistakable *E. laevigatum* is known at but a single station in this part of the country, in Jefferson County, West Virginia.

SELAGINELLA RUPESTRIS (L.) Spring. Abundant on sandstone outcrops, Catawba Mountain, nos. 3547 (G), 1964, 2761 (P).

ISOETES ENGELMANNI A. Br. Numerous plants growing permanently submerged in up to three feet of water in Spring Lake, Salem, no. 877 (P, Roanoke College); large plant in shallow water, marshy ground in deciduous woods, 1 mile north of Salem P. O., no. 5727 (P).

TSUGA CAROLINIANA Engelm. Rocky ravine of Fort Lewis Mountain, northwest of Salem, no. 2517; slope of Poor Mountain south of Wabun, no. 3745 (P); moist slope along Bottom Creek, 3 miles southwest of Airpoint P. O., no. 3201 (G); steep, wooded slope along Back Creek, $2\frac{1}{4}$ miles south-southwest of Starkey P. O., no. 4020 (P); ravines and wooded hillsides at Hanging Rock, no. 1813 (P), altitude 1100 feet.

Here near its northern limit, *Tsuga caroliniana* is rather characteristic of the higher slopes of the mountains in the western part of Roanoke County, usually being found on rocky ridges, but frequently occurring along streams. In his discussion of the species in Virginia, R. S. Freer¹ reported the tree from Roanoke

¹ *Claytonia* **3**: 7. 1936.

County and noted it in Bedford County at an altitude of 1,300 feet above sea level. Here it descends slightly lower, the last two stations cited being scarcely above 1000 feet.

THUJA OCCIDENTALIS L. Gnarled or, in favorable locations, slender trees on calcareous bluffs along the Roanoke River, nos. 893, 1021, 4095 (P).

SAGITTARIA AUSTRALIS (J. G. Sm.) Small. (*S. longirostra* of authors, not (Michx.) J. G. Sm.) Frequent in a spring-fed marsh along the west branch of Lick Creek, 1 mile west of Round Hill, no. 5515 (A, P).

Apparently an inland range-extension of a species occurring from Pennsylvania and Indiana southward, mostly on the Coastal Plain.

S. LATIFOLIA Willd., var. *PUBESCENS* (Muhl.) J. G. Sm. Abundant in an open marsh near the headwaters of Deer Branch, no. 5451 (A, G, P). Elsewhere in the county only typical *S. latifolia* has been found.

FESTUCA MYURUS L. Sandy roadside at the base of Fort Lewis Mountain, 3 miles northwest of Salem P. O., no. 2566 (P). Apparently not previously recorded from this part of Virginia.

POA CUSPIDATA Nutt. Wooded limestone bluffs along Roanoke River, nos. 1026, 1909 (P); wooded slope, $1\frac{1}{2}$ miles west-northwest of Airpoint P. O., no. 1135 (P); low, rocky woods near Bennett Springs Station, no. 908 (P).

ERAGROSTIS PECTINACEA (Michx.) Nees. Disturbed ground, Mill Mountain, no. 5262 (P); old field, Fort Lewis Mountain, north-northwest of Dixie Caverns, no. 3894 (P).

MELICA NITENS (Scribn.) Nutt. Steep, wooded dolomite bluffs along Roanoke River, $1\frac{1}{4}$ miles south-southwest of Wabun, no. 3677 (P).

STIPA AVENACEA L. Scattered plants in dry woods, summit of Little Brushy Mountain, 2 miles west-northwest of Salem P. O., no. 2423 (P).

DANTHONIA SERICEA Nutt. Acid soil in pine-oak woods, Fort Lewis Mountain, $3\frac{3}{4}$ miles northwest of Salem P. O., nos. 1285 (P), 2549 (G); dry woods, 2 miles north-northwest of Salem P. O., no. 2496 (P); sterile soil, Green Ridge just north of Hanging Rock, no. 3034 (P).

Although characteristically a plant of the Coastal Plain, *D. sericea* is not uncommon in siliceous soils of the ridges across the northern part of Roanoke County where *D. spicata* abounds.

BOUTELOUA CURTIPENDULA (Michx.) Torr. Abundant in an old pasture and at the exposed summit of dolomite bluffs along Roanoke River at Dixie Caverns, no. 3658 (A, G, P).

Heretofore noted in Virginia by Allard on Short Mountain, Shenandoah County¹, and by Massey in Russell and Montgomery Counties.²

DIGITARIA FILIFORMIS (L.) Koeler. Sandy roadside north of Salem P. O., no. 5761 (G, P).

PASPALUM CILIATIFOLIUM Michx., var. *MUHLENBERGII* (Nash) Fern. Dry soil along a fire-road in a deep ravine of Fort Lewis Mountain, north-northwest of Dixie Caverns, no. 5567 (P); dry roadsides, 1¾ miles north by west of Salem P. O., no. 5049 (A, G, P).

P. LAEVE Michx. Moist meadow near the headwaters of Deer Branch, no. 5506 (P), 5485 (G); meadow just north of Roanoke College campus, Salem, no. 5036 (P); old field, 1 mile northwest of Salem P. O., no. 825 (P, Roanoke College).

Widely scattered throughout the county, this grass is rapidly becoming a pernicious weed on the Roanoke College Campus where it forms spreading mats impossible to cut with a mower.

P. LAEVE, var. *PILOSUM* Scribn. Scrubby woods, ¾ mile north of Salem P. O., no. 5008 (P).

P. DILATATUM Poir. Several clumps in moist, disturbed ground at the base of a wooded limestone slope along Carvin Creek, 2 miles south-southwest of Hollins, no. 5531 (G, P).

Presumably not native here, but introduced from the Coastal Plain. *Lespedeza cuneata* G. Don, an Asiatic species widely planted and escaped in the eastern part of the state, and now appearing farther west, grows in an adjacent quarry, adding weight to this supposition.

PANICUM STIPITATUM Nash. Abundant in shallow water in a small pond-hole at the base of Fort Lewis Mountain, 1.9 miles north by west of Salem P. O., no. 5093 (A, P).

P. MERIDIONALE Ashe. Dry, sandy woods, ¾ mile north of Salem P. O., no. 753 (P); exposed, sandy ground at the summit of Little Brushy Mountain, no. 2443 (A).

A species showing upland-coastal plain distribution, not noted by Fernald³ in the Virginia mountains, but recently recorded from the Bull Run region in northern Virginia by Allard and Leonard.⁴

P. LATIFOLIUM L. Moist, wooded slope along Bottom Creek,

¹ Claytonia 5: 15. 1938.

² Ibid., 5: 49. 1939.

³ RHODORA 39: 478. Map 46. 1937.

⁴ Castanea 8: 19. 1943.

3 miles southwest of Airpoint P. O., no. 3184 (A, P). Rare in this region.

CYPERUS ACUMINATUS Torr. & Hook. Moist depression with *Diospyros* on the E. A. Smyth, Jr. estate, about $1\frac{1}{2}$ miles southwest of Salem P. O., no. 5017 (G, P).

Ranging widely in western U. S., but also having stations on the Atlantic Coastal Plain, *C. acuminatus* here occurs in the Blue Ridge, extending the range into the mountain area.

C. PSEUDOVEGETUS Steud. Scattered plants in shallow, acid water of a small pond at the base of Fort Lewis Mountain, 1.9 miles north by west of Salem P. O., no. 5094 (G, P).

A range-extension inland in Virginia of a plant typical of the Coastal Plain from New Jersey southward to Florida and Texas and to Kansas and Indiana.

C. REFRACTUS Engelm. Muddy roadside, Mill Mountain, no. 5264 (P); moist ground in an old field just northwest of Dixie Caverns, no. 2578 (P).

Recorded by Fernald from Southampton County on the Coastal Plain as new to Virginia in RHODORA 43: 536. 1941; here in the mountains.

C. OVULARIS (Michx.) Torr., var. SPHAERICUS Boeckl. Moist depressions at Broad Street and Mount Vernon Place, Salem, nos. 819 (P, Roanoke College), 4072 (G).

Discussed by Fernald in RHODORA 43: 537, 1941, and the range given as Arkansas to Oklahoma and Texas, Louisiana and Georgia, northward to southern Ohio, southern Indiana and Missouri with stations on the Virginia Coastal Plain. This station extends the range into the mountains of western Virginia. Elsewhere in the county the typical form occurs.

C. DENSICAESPITOSUS Mattf. & Kükenthal (*Kyllinga pumila* Michx.). Abundant in disturbed, sandy ground near the Baptist Orphanage swimming pool, 1 mile north of Salem P. O., no. 5712 (G, P).

ELEOCHARIS OBTUSA (Willd.) Schultes, var. JEJUNA Fern. With the typical form, along the moist margin of a small stream, about 1 mile north of Salem P. O., no. 5719a (P). Not heretofore noted in the Virginia mountains.

RYNCHOSPORA CYMOSA Ell. A few plants in shallow, acid water of a small pond at the base of Fort Lewis Mountain, 1.9 miles north by west of Salem P. O., no. 5088 (P).

Regarded as primarily a Coastal Plain plant ranging from New

Jersey and Pennsylvania to Florida and Texas and northward to Illinois and Indiana, the species here occurs west of the Blue Ridge with *Panicum stipitatum*, *Rhynchospora glomerata* (L.) Vahl, var. *minor* Britton, *Carex lupulina*, *Lysimachia hybrida*, and the few scraps of *Sphagnum* known in Roanoke County.

SCLERIA TRIGLOMERATA Michx. Wet, sandy soil beside a small spring, wooded slope of Fort Lewis Mountain, 4 miles northwest of Salem P. O., no. 5641 (P). Rare here.

CAREX PENNSYLVANICA Lam. Steep slope with calcareous outcrops along the Roanoke River at Dixie Caverns, no. 1101 (P). Not seen by Mackenzie from the state and first recorded by Fernald from southeastern Virginia¹. Although this species usually grows in acid soils, the pH at this locality is about 7.5.

C. TONSA (Fern.) Bickn. Dry, brushy hillside, about $\frac{3}{4}$ mile north of Salem P. O., no. 1041 (P). Not seen by Mackenzie from Virginia, but noted by Fernald in Isle of Wight and Southampton counties²; this is apparently the first mountain station to be recorded.

CAREX HITCHCOCKIANA Dewey. Moist, wooded, east-facing limestone slope at Dixie Caverns, no. 5380 (G, P).

SPIRODELA POLYRHIZA (L.) Schleid. Abundant in a small pond-hole near Roanoke River, 2 miles southeast of Salem; abundant in a large spring at the head of Lick Creek, 1 mile west of Round Hill.

JUNCUS EFFUSUS L., var. *PYLAEI* (Laharpe) Fern. & Wieg. Muddy shore of Roanoke River, 0.8 mile south-southwest of Salem P. O., no. 1249 (P).

Rare this far south and not previously noted in this part of Virginia; *J. EFFUSUS*, var. *SOLUTUS* Fern. & Wieg. is the common form.

XEROPHYLLUM ASPHODELOIDES (L.) Nutt. Numerous plants in acid soil in low, scrubby woods, south-facing slope of Green Ridge, $2\frac{1}{4}$ miles northeast of Hanging Rock, no. 3442 (G); acid, rocky woods at Hanging Rock, no. 1835 (A, G, P); rocky, shaded ravine between Yellow and Buck Mountains, $5\frac{1}{4}$ miles south of Roanoke P. O., no. 5357 (P).

Abundant where found. Recorded from adjoining Bedford County by Freer.³

ZIGADENUS GLAUCUS Nutt. (*Z. chloranthus* of Gray, Manual, ed. 7, not Richardson; *Anticlea chlorantha* (Richards.) Rydb. of Britton & Brown and Small.) Scattered plants in shaly soil,

¹ RHODORA 40: 399. 1938.

² RHODORA 40: 399. 1938.

³ Claytonia 4: 15. 1937.

margin of second-growth oak woods, ridge of Poor Mountain, about $3\frac{1}{4}$ miles south of Wabun, no. 3824 (G, P), flowering, July 10, 1942; no. 5669 (A, P), fruiting, September 10, 1942.

The occurrence of isolated stations of this species or a closely related plant in the southern Appalachians is of some interest. In his discussion of *Zigadenus glaucus* and *Z. elegans* Pursh, Fernald¹ gave the habitat and range of the former as "calcareous gravel, cliffs, shores and bogs, chiefly of the St. Lawrence drainage, Mingan Islands and Anticosti, Quebec to Minnesota, south to northern New Brunswick, western New York, northern Ohio, northern Indiana and Illinois." He did not include stations south of this area, presumably because of the uncertain and fragmentary nature of the southern material. Small², however, noted *Anticlea chlorantha* in the Blue Ridge of North Carolina, apparently on the basis of two specimens in the herbarium of the New York Botanic Garden from Buncombe County, North Carolina: Elk Mountain, Mrs. Anne R. Clement, (a portion of a flowering stalk and three leaves) and "near Asheville", August 2, 1893, B. L. Robinson, (a full-size drawing of a plant, and a single flower mounted between squares of mica).

On July 6, 1942, Mr. Lloyd G. Carr told me of his finding *Z. glaucus* in some abundance on the limestone cliffs and ledges at Natural Tunnel in Scott County, Virginia. This was the first find of *Zigadenus* in the state. A few days later the small Roanoke County colony noted above was discovered on Poor Mountain at an altitude of about 3000 feet. These Virginia and North Carolina stations are apparently the only ones known in the southern Appalachians, although the plant is presumably more widespread in this area. The southern localities are seemingly quite isolated from the northern occurrences, although linking stations in West Virginia may possibly exist. Dr. Core writes me, however, that he knows of no records from West Virginia although he has looked for the plant there.

The North Carolina material, fragmentary though it be, seems to match the Virginia plants in all respects. However, the relationship of the southern and northern plants is not yet clear. The isolation of the southern stations is suggestive in

¹ RHODORA 37: 256-258. 1935.

² Manual of the Southeastern Flora. 274. 1933.

itself, and some differences between the two plants may exist, but I do not feel that the material at present is sufficient to justify any conclusions regarding the distinctness of the plant of the southern Appalachians from that of the St. Lawrence basin. The Virginia plants are tentatively placed, therefore, under *Zigadenus glaucus* Nutt.¹

MELANTHIUM VIRGINICUM L. Dryish, rocky woods near Big Bear Rock Gap, Fort Lewis Mountain, no. 5611 (P). Rather rare in the uplands.

M. PARVIFLORUM (Michx.) Wats. Scattered localities in the southern part of the county, nos. 3100, 3308 (P). Rather frequent in the mountains, but not often noted.

ALLIUM CERNUUM Roth. Typical material occurs at many stations; variants: cool, rocky woods, summit of Fort Lewis Mountain, 3 miles north by west of Glenvar, no. 5621 (P), approaching *A. oxyphilum* Wherry; steep, wooded slope with limestone ledges along the Roanoke River, 1¼ miles southwest of Wabun, no. 4083 (A, G, P); rich wooded slope of Gravelly Ridge near the Roanoke-Botetourt County line, no. 5377 (P). At the last two localities, where the plant grows on calcareous rocks, the flowers are either pink or white. Elsewhere, only white-flowered plants have been seen. No. 5377 from Gravelly Ridge is unusual in its bright pink, short-pedicel flowers in a nearly erect umbel, suggesting the more western *A. stellatum*.

LILIUM MICHAUXII Poir. (*L. carolinianum* Michx.). Acid soil, ridge of Poor Mountain, no. 3797 (P), 5679 (G); shaly slope Fort Lewis Mountain, northwest of Dixie Caverns, no. 3937 (P); cool, oak woods, 3 miles north by west of Glenvar, no. 5617 (P). Additions to the stations recorded by Fernald, RHODORA 41: 471. Map 13. 1939.

SMILACINA RACEMOSA (L.) Desf., var. *TYPICA* Fern. (RHODORA 40: 407. 1938). Acid woods, Green Ridge, 2.7 miles northeast of Hanging Rock, no. 3460 (P).

S. RACEMOSA, var. *CYLINDRATA* Fern. (RHODORA 40: 406. 1938). Widely distributed, many numbers, (G, P).

A few intermediates between this and var. *typica* occur, but in Roanoke County most specimens are easily referable to this more southern form with its shorter cylindric panicle, fewer flowers, and longer flowering peduncle.

CONVALLARIA MAJUSCULA Greene. Common in the rocky soils of the mountain-tops. Many numbers (P).

¹ In this connection, Dr. Edgar T. Wherry advises me that he has studied a colony of a *Zigadenus* on Tennessee Bald Mountain, North Carolina, and considers it an undescribed species

TRILLIUM ERECTUM L., var. *ALBUM* (Michx.) Pursh. Small colony in alluvial soil along a small stream, Bent Mountain, May 17, 1940, C. E. Wood, Jr. (Roanoke College).

SMILAX GLAUCA Walt., var. *GENUINA* Blake. Acid, oak-pine woods near Bradshaw, 4 miles northwest of Dixie Caverns, no. 2679 (P).

S. GLAUCA, var. *LEUROPHYLLA* Blake. Several localities on Bent Mountain, Poor Mountain, Little Brushy Mountain, nos. 3261, 5684, 2448 (P).

DIOSCOREA OPPOSITA Thunb. (*D. Batatas* Dene.). Escaped from cultivation in vacant lots along College Avenue, south of Main Street, Salem, no. 5043 (P).

D. QUATERNATA (Walt.) Gmel., var. *GLAUCA* (Muhl.) Fern. Abundant in almost every patch of woodland and on every moist slope where, with its leaves glaucous beneath and the lowermost whorled, it is a familiar sight throughout the county. Many numbers (P, G).

CLEISTES DIVARICATA (L.) Ames. A few plants in moist, siliceous soil in pine-oak woods of the south slope of Fort Lewis Mountain, 4 miles northwest of Salem P. O., no. 1276 (P).

Range-maps of this orchid published by Braun¹ and Fernald² show many stations on the Atlantic Coastal Plain and scattered stations in the mountains of North Carolina. No occurrences of the plant in the Virginia mountains were noted, but Wherry subsequently recorded a station in Craig County just to the north of Roanoke County³. The present locality adds a second station in western Virginia. I recall seeing in former years a single plant in a ravine about a mile distant from this locality. *Cleisthes* is probably widely scattered in the moist (not wet), mediacid soils of the southern slope of Fort Lewis Mountain, although its occurrence from year to year is undoubtedly sporadic.

HEXALECTRIS SPICATA (Walt.) Barnhart. Several plants on a steep, semi-wooded dolomite bluff on Roanoke River at Dixie Caverns, no. 3648 (July 6, 1942, in bud) (A); no. 3648a (July 13, 1942, in flower) (P). Rare in the Virginia mountains.

SALIX LUCIDA Muhl. Shrub (15–20 feet) growing in sandy wash, rocky banks of Bottom Creek, Poor Mountain, about 2¼ miles northwest of Airpoint P. O., no. 3870 (P, Herb. C. R. Ball).

Dr. Ball has very kindly checked these and other willow specimens and writes me (Oct. 16, 1942) that he knows of no other

¹ RHODORA 39: 197. Map 10. 1937.

² Ibid., 39: 327. Map 2. 1937.

³ Claytonia 4: 54. 1938.

station for this willow south of the Pennsylvania-Maryland line. *S. lucida* is presumably native at this locality, however. The station is at an altitude of over 3000 feet where conditions are suitable for northern plants, and, indeed, many of the accompanying plants are of high altitude or northern types, e. g. *Betula lutea*, *Viola rotundifolia*, *V. pallens*, *Trientalis borealis*, and *Viburnum alnifolium*.

SALIX PURPUREA L. Scattered, shrubby trees, introduced and spreading in marshy ground along the west branch of Lick Creek, 1 mile west of Round Hill, no. 5525 (G, P).

QUERCUS BICOLOR Willd. A single tree (about 40 feet high) at the edge of an open, spring-fed marsh at the headwaters of Deer Branch near the old Hollins School, no. 5503 (A, G, P). This occurrence is in the central valley in an area underlain by limestones. I have not found the species elsewhere in the county.

Q. MUHLENBERGII Engelm. Moist, wooded slope at Dixie Caverns, no. 3390 (P); abundant on dolomite bluffs along Roanoke River at Dixie Caverns, nos. 3702, 3701, 3697 (P), 3696 (A), 3695 (G). Very abundant on limestone slopes, and here showing considerable diversity in foliage.

CELTIS OCCIDENTALIS L., var. **CRASSIFOLIA** (Lam.) Gray. Moist woods, summit of Catawba Mountain, $\frac{3}{4}$ mile west-northwest of Catawba Sanitarium Station, no. 3513 (P).

C. PUMILA (Muhl.) Pursh. Low shrubs, 3-4 feet high, in an old pasture with dolomite outcrops, steep slope along the Roanoke River at Dixie Caverns, no. 3654 (G, P); a small tree about 15 feet high with scarcely toothed leaves and spherical, orange fruits on a wooded limestone slope along Carvin Creek, about 2 miles south-southwest of Hollins, no. 5526 (G, P).

ULMUS ALATA Michx. A medium-sized tree, suckering from the roots, on an open hilltop near the ruins of an old house, 0.8 miles north of Salem P. O., no. 1065 (P).

This may represent an introduction, for near the colony a cultivated species of *Opuntia* is well established and is spreading. However, *Ulmus alata* is itself well established at this locality and is spreading vegetatively at present; no fruit has been noted.

BROUSSONETIA PAPYRIFERA (L.) Vent. Vacant lots, roadsides: Salem, nos. 5040, 5041 (A, P). Well established and apparently spreading. Only staminate trees have been noticed, however. A very large and old staminate tree has stood on the Roanoke College campus for many years.

MORUS ALBA L., var. **TATARICA** (L.) Loud. Vacant lots, roadsides in and near Salem, no. 5784 (P). This is the common red-fruited tree. At one time a few trees of the typical, white-

fruited form were established in an orchard in Salem, but these have been destroyed.

PHORADENDRON FLAVESCENS (Pursh) Nutt. On *Quercus rubra*, Hollins College, November 20, 1936, P. M. Patterson (Hollins College); seen on *Acer saccharinum* on the Hollins College campus, December 1942; a small specimen in the top of a young tree of *Diospyros virginiana* in a moist depression near the home of Miss Grace Smyth, who pointed out the plant, 1.6 miles southwest of Salem P. O.

BUCKLEYA DISTICHOPYLLA (Nutt.) Torr. A large colony extending for several hundred yards along a stream beneath *Tsuga canadensis* on each side of the Roanoke-Craig County line on Highway 311 in the ravine between Cove and North Mountains, Freeman, U. S. National Herb. no. 81044; C. E. Wood, Jr. no. 5440 (A, G, P).

Discovered by O. M. Freeman and reported by him in *Castanea* 6: 76. 1941. I found the plants in abundant fruit in early September 1942. The spot is sometimes used as a picnic area, but it is unlikely that the colony will be destroyed unless felling of the hemlocks in the ravine is attempted.

PYRULARIA PUBERA Michx. Moist, rocky woods, Green Ridge at Hanging Rock, no. 796 (P); damp, wooded ravine of Fort Lewis Mountain, 2.7 miles northwest of Salem P. O., no. 829 (P); moist, wooded slope, 3 miles southwest of Airpoint P. O., no. 3198 (P); moist, wooded slope along Back Creek, 2¼ miles south-southeast of Starkey P. O., no. 4037 (A); rich slope along Back Creek, 1.9 miles south-southwest of Cave Spring, no. 3320 (G, P). Widely distributed and not uncommon where found.

POLYGONUM TENUE Michx. Abundant on an open, shaly slope of Fort Lewis Mountain, 2.9 miles north-northwest of Dixie Caverns, with *Clematis albicoma*, var. *coactilis*, no. 3931 (P), 5592 (G).

P. COCCINEUM Muhl. Common in shallow water of a spring-fed marsh at the headwaters of Deer Branch, no. 5510 (P). Rare this far south.

P. SETACEUM Baldw., var. *INTERJECTUM* Fern. Low, moist depressions along Mason Creek at Hanging Rock, no. 782 (P, Roanoke College).

P. ORIENTALE L. Scattered plants in weedy ground at the top of the old inclined railway on Mill Mountain, Roanoke, no. 5278 (P). Rare in this region.

AMARANTHUS SPINOSUS L. Weedy lots, Salem, no. 5777 (P); barnyard, 1.6 miles southwest of Salem, no. 5027 (P). A well established and obnoxious weed.

A. GRAECIZANS L. Scattered plants along the Norfolk and

Western Railroad tracks at Randolph Street, Roanoke, nos. 3706 (P), 3703 (G).

OXYBAPHUS NYCTAGINEUS (Michx.) Sweet. Scattered plants with *Amaranthus graecizans*, no. 3704 (P).

STELLARIA LONGIFOLIA Muhl. Moist meadow on Bottom Creek, Bent Mountain, 3 miles southwest of Airpoint P. O., no. 3275 (P).

S. AQUATICA (L.) Scop. With *S. longifolia*, no. 3265 (P).

SILENE CUCUBALUS Wibel. (*S. latifolia* (Mill.) Britten & Rendle.) Roadsides, 4.8 miles southwest of Airpoint P. O., no. 3229 (P).

Fernald recorded the species from York and Henrico Counties in eastern Virginia, extending the range south from Maryland and the District of Columbia.¹ This is the southernmost station in the mountains thus far noted.

LYCHNIS ALBA Mill. Disturbed roadsides, Bent Mountain, nos. 3141, 1137, 3230 (P); along fire-road, Fort Lewis Mountain, 2.9 miles north-northwest of Dixie Caverns, no. 3893 (P).

Well established, particularly on the plateau of Bent Mountain where with *Silene dichotoma* Ehrh. it imparts a characteristic appearance to the roadsides. Deam (*Flora of Indiana*) gives the range of this plant as Nova Scotia to Michigan, southward to New York and Pennsylvania.

CALTHA PALUSTRIS L. Swampy alder thickets, 1 mile north-west of Airpoint P. O., no. 1105 (P); wet thickets along a small stream, $4\frac{1}{4}$ miles west of Catawba Sanitarium Station, no. 1976 (P).

CLEMATIS ADDISONII Britton. Dryish, shaly soil over limestone, steep, wooded dolomite bluffs along Roanoke River, $1\frac{1}{4}$ miles south-southwest of Wabun, no. 148 (G, P).

Clematis Addisonii was described from specimens collected along the Roanoke River south of Roanoke by Britton and others of the Torrey Club who visited the region in the spring of 1890.² In succeeding years J. K. Small and others visited the locality and many specimens of the plant were collected and placed in most of the major herbaria. When Britton's group first visited Roanoke, the *Clematis* was abundant along the river south of the town, but Small and Vail collecting there two years later wrote: "The locality discovered in 1890 was again visited and found to have been nearly obliterated by the quarrying down of the hill

¹ RHODORA 43: 551. 1941.

² See Mem. Torr. Bot. Cl. 2: 28. 1890.

in the process of building new streets, so that where hundreds of plants were seen before, not more than a couple of dozen were noticed."¹ Since then *C. Addisonii* has apparently not been collected in the county and this locality has now been completely covered by the city of Roanoke. However, the plant occurs along the dolomite cliffs and bluffs farther west and in a few other counties in this region (Montgomery, Bedford, Botetourt, and Rockbridge).

C. ALBICOMA Wherry, var. *COACTILIS* Fern. This endemic plant of shaly slopes was figured and fully described from Roanoke County specimens by Professor Fernald in *RHODORA* 45: 407, Plate 780, 1943.

CALYCANTHUS FERTILIS Walt. Abundant on moist, wooded limestone slopes just northwest of Dixie Caverns, no. 3584 (G, P).

Shrubs, 6–8 feet tall, with glabrous, glaucous leaves. The crushed flowers are strawberry-scented, manuals to the contrary.

BERBERIS THUNBERGHII DC. Numerous seedlings becoming established along Highway 311 north of Hanging Rock, no. 1836 (P).

THLASPI PERFOLIATUM L. Scattered plants along roadside, 2 miles southeast of Salem P. O., flowering and fruiting, April 5, 1942, no. 1901 (P). Rare in Virginia.

CAMELINA MICROCARPA Andr. Roadside at Bradshaw, 4 miles northwest of Dixie Caverns, no. 2693 (P).

DRABA VERNA L. Abundant in a hillside pasture at Dixie Caverns, no. 1007 (P); lawn weed, Salem, no. 1947 (P). Seldom collected or noted.

ERYSIMUM CHEIRANTHOIDES L. Wooded slope of Little Brushy Mountain, no. 2462 (P).

TIARELLA WHERRYI Lakela. See Fernald, *RHODORA* 45: 445. 1943. Abundant on a moist, wooded hillside above Back Creek, about 2¼ miles south-southeast of Starkey P. O., no. 4028 (A, G, P).

POTENTILLA RECTA L. Abundant along the Virginian Railroad at Salem, no. 1230 (P); roadsides at Dixie Caverns, no. 3664 (P).

RUBUS PHOENICOLASIUS Maxim. Along road at the base of jutting granitic cliffs on a moist, wooded slope along Back Creek, 2¼ miles south-southeast of Starkey P. O., no. 4013 (G, P).

First reported from Virginia by Fernald² who found the plant along Three Creek, Drewryville, Southampton County. This

¹ *Ibid.*, 4: 96. 1893.

² *RHODORA* 40: 434. 1938.

Asiatic species is just becoming established in Roanoke County and seems to be otherwise unknown in the Virginia mountains.

R. ENSLENI Tratt. Shaly roadbank in sterile, acid woods on the south slope of Green Ridge, $2\frac{1}{4}$ miles northeast of Hanging Rock, no. 3453 (P); sterile oak-pine woods along Fire-Road 4058, 4 miles northwest of Dixie Caverns, no. 2605 (P).

R. ALLEGHENIENSIS Porter, var. *CALYCOSUS* Fern. (*RHODORA* 10: 51. 1908). Roadside, along Bottom Creek, Poor Mountain, $2\frac{1}{4}$ miles northwest of Airpoint P. O., no. 3856 (A, P).

PRUNUS PENNSYLVANICA L. f. Small tree among low scrub at the open summit of Poor Mountain, altitude 3960 feet, no. 5691 (P). Found here only at the highest altitudes.

CORONILLA VARIA L. A well-established colony along a dirt road, 0.8 miles northeast of Salem P. O., no. 5037 (A, G, P).

Previously reported in Virginia from Russel County by A. B. Massey in *Claytonia* 5: 50. 1939.

(To be continued)

A FURTHER ITEM ON *LILIUM MICHIGANENSE*.—*Lilium michiganense* Farwell has been so supported and so condemned by various recent authors that I hesitate, without intimate field-knowledge of it, to take sides. However, much of the discussion of it in relation to *L. canadense* L. and *L. superbum* L. has been by botanists with at least only a minimum of field-acquaintance with one or both of those species. I may, therefore, be pardoned if I call attention to some points which have not been emphasized. In Deam's *Flora of Indiana* very valuable notes are given and a real help comes from his item on umbellate and non-umbellate inflorescences. Of course, when the flowers are solitary this character is useless but when there are several flowers it is very real. Taking all the material in the Gray Herbarium and the Herbarium of the New England Botanical Club with 3 or more flowers, I get the following score. *L. CANADENSE*, 1 or more umbels or near-umbels, 49 nos.; flowers scattered, not subumbellate, 2. *L. MICHIGANENSE*, 1 or more umbels or near-umbels, 40; flowers scattered, not subumbellate, 0. *L. SUPERBUM*, 1 or more umbels or near-umbels, 26; flowers scattered, not subumbellate, 44. In other words, the tendency to an umbellate inflorescence is stronger in *L. canadense* and *L. michiganense* than in *L. superbum*.

In RHODORA, xliv. 455 (1942) Dr. Wherry (in his key) noted *Lilium canadense* and *L. michiganense* as having "anthesis early aestival", while in *L. superbum* it is "late-aestival". Here is a real point which may well be amplified. Taking, again, all flowering material in the two large herbaria at hand and recording the date of collection of all with expanded flowers I get the following score: *L. CANADENSE* (166 specimens) flowering from mid-June (11th) to early August, with average date July 6; *L. MICHIGANENSE* (43 sheets) flowering from late June (25th) through July, with average date July 6 (the same as *L. canadense*); *L. SUPERBUM* (63 specimens) flowering from mid-July (16th) to early September, with average date August 1. If, as some maintain, the exclusively inland and rather northern *L. michiganense* is identical with the chiefly coastwise and decidedly southern *L. superbum*, is it not remarkable that their periods of anthesis should be so different?

Many morphological characters more or less separating the two latter have repeatedly been pointed out. To these I should add the deeply 3-lobed stigma of *L. superbum* as opposed to the more broadly and shallowly lobed stigma of *L. michiganense* and I can not overlook the fact that the usually longer anthers of the former species are essentially linear, those of the latter species shorter and more oblong. I am, at least from herbarium-material, unable to unite these species.—M. L. FERNALD.

CIRSIIUM FLODMANI IN NEW ENGLAND.—In RHODORA, 45 (1943), 356, Professor Fernald reported that the prairie and plain species *Cirsium Flodmani* (Rydb.) Arthur, supposed to reach its eastern limits in Manitoba, Minnesota, and Iowa, is also known from the Temagami Forest Reserve in Ontario and from Essex County, N. Y., and queried whether these were native stations or the results of recent eastward migration.

This species is a segregate from *C. undulatum* (Nutt.) Spreng., under which name a thistle is reported in E. J. Dole's *Flora of Vermont* (1937), 264, from Wells River, Vt. Mr. C. A. Weatherby has kindly called my attention to this citation, and also to the fact that a specimen in the New England Botanical Club Herbarium, collected by me in a dry pasture south of Island Pond,

Brighton, Essex Co., Vt., on 6 Aug., 1940, clearly belongs to *C. Flodmani*. Whether the plant is here native or introduced may still be queried, but at any rate it is now a species to be considered in any enumeration of the plants of New England.—ARTHUR STANLEY PEASE, Harvard University.

SPERGULA PENTANDRA IN AMERICA.—*Spergula arvensis* in its varying forms is so common and has so often encouraged amateurs to hope that they had something novel, besides typical *S. arvensis* L. and its var. *sativa* (Boenn.) Reichenb., that weed-hunters may welcome the fact that another real species has arrived from Europe. On April 8, 1942, the keen student of the Cape May flora, O. H. Brown, collected a weed in Cold Spring Cemetery at Cold Spring, Cape May, New Jersey, which, referred to me through Mr. Long, proves to be the European *S. pentandra* L., which is sufficiently different from *S. arvensis* to satisfy any one. In the former the leaves are channeled at base, the plump seeds with a very narrow wing. *S. pentandra* is a smaller plant, the filiform leaves scarcely channeled, and its smooth flat seeds have a wing as broad as the body. It should be watched for; the cemetery at Cold Spring is probably not its only American station.—M. L. FERNALD.

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